VERIFICATION OF TRANSLATION

I, Shunichi Higuchi, of 12-7, Aza Fujigaoka, Oaza Fujie, Higashiura-cho, Chita-gun, Aichi 470-2105 Japan, hereby declare that I am conversant with the English and Japanese languages and that I am the translator of the document attached and certify that to the best of my knowledge and belief the following is a true and correct English translation of Japanese Patent Application No. 2003-11514.

Name: Shunichi Higuchi

Signature: Shunichi Higuchi

Date: November 13, 2009

[Document name] Description

[Title of the invention] Occupant protection device

[Claims]

[Claim 1] An occupant protection device comprising an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, wherein the airbag includes an inflatable body having an external shape such that the inflatable body extends along the inner side of the door and the side of the occupant facing the door to fill a space between the inner side of the door and the side of the occupant facing the door in the inflated state.

[Claim 2] An occupant protection device comprising an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, wherein the airbag includes a recess for receiving a projecting portion that projects in the vehicle width direction from one of the inner side of the door and the side of the occupant facing the door in the inflated state.

[Claim 3] The occupant protection device according to Claim 2, wherein the projecting portion is the upper arm of the occupant.

[Claim 4] The occupant protection device according to Claim 2, wherein the projecting portion is an armrest provided on the inner side of the door.

[Claim 5] An occupant protection device comprising an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, wherein the airbag includes an upper inflatable body and a lower inflatable body disposed so as to face each other from above and below across an armrest provided on the inner side of the door.

[Claim 6] The occupant protection device according to Claim 5, wherein the upper inflatable body of the airbag has a region which is thinner than other regions in the vehicle width direction in the inflated state at a position corresponding to the upper arm of the occupant.

[Claim 7] The occupant protection device according to Claim 5, wherein the upper inflatable body of the airbag is thicker than the lower inflatable body in the vehicle width direction in the inflated state.

[Claim 8] The occupant protection device according to Claim 5, wherein the lower inflatable body of the airbag is inflated before the upper inflatable body.

[Claim 9] The occupant protection device according to Claim 8, wherein each of the lower inflatable body and the upper inflatable body of the airbag has a dedicated inflator.

[Detailed explanation of the invention]

[0001]

[Technical Field of the invention]

The present invention relates to an occupant protection device including an airbag for protecting an occupant by being inflated with gas supplied from an inflator when, for example, a side collision or the like of a vehicle occurs.

[0002]

[Prior art]

This type of occupant protection device is described in, for example, Patent document 1 below. This document discloses an occupant protection device including an airbag (airbag body) disposed such that the airbag can be inflated at the side of an occupant which is adjacent to a door. When a

side collision or the like of a vehicle occurs, the airbag is inflated with gas supplied from an inflator in order to protect the head and chest of the occupant.

[0003]

[Patent document 1]

Japanese Unexamined Patent Application Publication No. H9-202203

[0004]

[Problem to be resolved by the invention]

In the occupant protection device according to the above-mentioned publication, when a side collision of the vehicle occurs, the airbag protects the head and chest of the occupant. However, in the occupant protection device according to the above-mentioned publication, the shape of the airbag is not determined with the consideration of the occupant's body shape or the shape of the door. Therefore, there is a risk that the inflated airbag will apply a large local load to the chest of the occupant, and there is a room for improvement. Therefore, an object of the present invention is to prevent the chest of an occupant from receiving a large load when a side collision or the like of a vehicle occurs.

[0005]

[Means to solve the problem]

A feature of the present invention (invention according to Claim 1) is that an occupant protection device includes an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, the airbag including an inflatable body having an external shape such that the inflatable body extends along the inner side of the door and the side of the

occupant facing the door to fill a space between the inner side of the door and the side of the occupant facing the door in the inflated state.

[0006]

A feature of the present invention (invention according to Claim 2) is that an occupant protection device includes an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, the airbag including a recess for receiving a projecting portion that projects in the vehicle width direction from one of the inner side of the door and the side of the occupant facing the door in the inflated state.

[0007]

In this case, it is preferable (invention according to Claim 3) is that the projecting portion is the upper arm of the occupant. It is preferable (invention according to Claim 4) is that the projecting portion is an armrest provided on the inner side of the door.

[0008]

A feature of the present invention (invention according to Claim 5) is that an occupant protection device includes an airbag that is inflated with gas from an inflator at a side of an occupant which faces a door to protect the body of the occupant from the shoulder to the lumbar, the airbag including an upper inflatable body and a lower inflatable body disposed so as to face each other from above and below across an armrest provided on the inner side of the door.

[0009]

In this case, it is preferable (invention according to Claim 6) is that the upper inflatable body of the airbag has a region which is thinner than

other regions in the vehicle width direction in the inflated state at a position corresponding to the upper arm of the occupant. It is preferable (invention according to Claim 7) is that the upper inflatable body of the airbag is thicker than the lower inflatable body in the vehicle width direction in the inflated state.

[0010]

It is preferable (invention according to Claim 8) is that the lower inflatable body of the airbag is inflated before the upper inflatable body. It is preferable (invention according to Claim 9) is that each of the lower inflatable body and the upper inflatable body of the airbag has a dedicated inflator.

[0011]

[Action and effect of the invention]

In the occupant protection apparatus according to the present invention (invention according to Claim 1), when a side collision or the like of the vehicle occurs, the airbag is inflated with the gas from the inflator at the side of the occupant facing the door, and is placed between the door and the body of the occupant from the shoulder to the lumbar. Therefore, if the door of the vehicle enters the vehicle cabin, the occupant is pushed by the airbag toward the center of the vehicle cabin in the vehicle width direction, and accordingly the body of the occupant from the shoulder to the lumbar is protected.

[0012]

In this occupant protection device, the airbag includes the inflatable body having the external shape such that the inflatable body extends along the inner side of the door and the side of the occupant facing the door to fill

the space between the inner side of the door and the side of the occupant facing the door in the inflated state. Therefore, in this occupant protection apparatus, the substantial contact area between the airbag and the occupant is increased. Accordingly, when a side collision or the like of the vehicle occurs, the chest and the like of the occupant is prevented from receiving a large local load.

[0013]

In the occupant protection apparatus according to the present invention (invention according to Claim 2), the airbag includes a recess for receiving a projecting portion that projects in the vehicle width direction from one of the inner side of the door and the side of the occupant facing the door in the inflated state. Therefore, in this occupant protection device, the recess of the airbag for receiving the projecting portion that projects in the vehicle width direction from one of the inner side of the door and the side of the occupant facing the door prevents a particular part, for example, the chest of the occupant from being locally pressed. Accordingly, when a side collision or the like of the vehicle occurs, a particular part, for example, the chest of the occupant is prevented from receiving a large local load.

[0014]

In the occupant protection apparatus according to the present invention (invention according to Claim 3), the projecting portion is the upper arm of the occupant and the recess of the airbag receives the upper arm of the occupant in the inflated state. Therefore, the load applied to the chest of the occupant from the upper arm of the occupant pushed by the inflated airbag is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest of the occupant is prevented from receiving a large

local load.

[0015]

In the occupant protection apparatus according to the present invention (invention according to Claim 4), the above-described projecting portion is an armrest provided on the inner side of the door and the recess of the airbag receives the armrest on the inner side of the door in the inflated state. Therefore, the inflated airbag is prevented from being pushed by the armrest on the inner side of the door, and the load applied to the chest of the occupant from the airbag is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest of the occupant is prevented from receiving a large local load.

[0016]

In the occupant protection apparatus according to the present invention (invention according to Claim 5), the airbag includes an upper inflatable body and a lower inflatable body disposed so as to face each other from above and below across an armrest provided on the inner side of the door. Therefore, when the door of the vehicle enters the vehicle cabin, neither of the upper and lower inflatable bodies of the airbag is largely pushed by the armrest on the inner side of the door. The upper inflatable body of the airbag mainly pushes the shoulder of the occupant toward the center of the vehicle cabin in the vehicle width direction, and the lower inflatable body of the airbag mainly pushes the lumbar of the occupant toward the center of the vehicle cabin in the vehicle width direction. Accordingly, when a side collision or the like of the vehicle occurs, the chest of the occupant is prevented from receiving a large local load.

[0017]

In the occupant protection apparatus according to the present invention (invention according to Claim 6), the upper inflatable body of the airbag has a region which is thinner than other regions in the vehicle width direction in the inflated state at a position corresponding to the upper arm of the occupant. Therefore, the upper arm of the occupant is prevented from being pushed by the upper inflatable body of the inflated airbag, and the load applied to the chest of the occupant by the upper arm of the occupant pushed by the upper inflatable body is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest of the occupant is prevented from receiving a large local load.

[0018]

In the occupant protection apparatus according to the present invention (invention according to Claim 7), the upper inflatable body of the airbag is thicker than the lower inflatable body in the vehicle width direction in the inflated state. Therefore, a relatively large upper space between the shoulder of the occupant and an upper portion of the door above the armrest and a relatively small lower space between the lumbar of the occupant and a lower portion of the door below the armrest can be reliably filled with the upper and lower inflatable bodies of the airbag. Accordingly, the occupant can be reliably protected.

[0019]

In the occupant protection apparatus according to the present invention (invention according to Claim 8), the lower inflatable body of the airbag is inflated before the upper inflatable body. Therefore, the lower inflatable body of the airbag can be reliably inflated in the lower space between the lumbar of the occupant and the lower portion of the door below

the armrest, which is smaller than the upper space between the shoulder of the occupant and the upper portion of the door above the armrest.

[0020]

In the occupant protection apparatus according to the present invention (invention according to Claim 9), each of the lower inflatable body and the upper inflatable body of the airbag has a dedicated inflator. Therefore, the times at which the inflators are activated can be controlled individually, and the upper and lower inflatable bodies of the airbag can be inflated individually at desired times.

[0021]

[Embodiment for Carrying Out the Invention]

Embodiments of the present invention will be described below with reference to the drawings. Figs. 1 and 2 schematically illustrate an occupant protection device according to a first embodiment of the present invention. The occupant protection device according to the first embodiment is attached to a seat back Aa of a seat A of a vehicle and includes an airbag 10 disposed such that the airbag 10 can be inflated at the side of an occupant B which is adjacent to a door C and an inflator 20 that supplies gas to the airbag 10.

[0022]

When a side collision or the like of the vehicle occurs, the airbag 10 is inflated at the side of the occupant B adjacent to the door C with gas supplied from the inflator 20, as shown in Figs. 1 and 2. Thus, the airbag 10 protects the side of the occupant B in a region from the shoulder Ba to the lumbar Bd including the chest Bb and the abdomen Bc. Normally, the airbag 10 is stored in the seat back Aa in a folded state.

[0023]

In addition, the airbag 10 is formed in a bag-like shape by folding an airbag material with a predetermined shape in half and airtightly bonding a peripheral region 11 thereof. The airbag 10 has a recess 12 for receiving a projecting portion of the occupant B, i.e., the upper arm Bf that projects in the vehicle width direction from the side of the occupant B facing the door C, in the inflated state. The recess 12 of the airbag 10 is formed by cutting out the corresponding portion of the airbag 10 in advance.

[0024]

The inflator 20 is activated and supplies gas to the airbag 10 when a side collision or the like of the vehicle occurs (such a situation is detected by a sensor (not shown)). The inflator 20 is disposed in the airbag 10 and has gas discharge holes 21 and 22 at the top and bottom ends, respectively. The gas discharge hole 21 faces upward to discharge the gas upward, and the gas discharge hole 22 faces downward to discharge the gas downward.

[0025]

In the occupant protection device according to the first embodiment that is structured as described above, if a side collision or the like of the vehicle occurs, the inflator 20 is activated when an acceleration detected by a corresponding sensor (not shown) exceeds a set value. Accordingly, the gas is supplied to the airbag 10 through the gas discharge holes 21 and 22 of the inflator 20, and the airbag 10 is inflated at the side of the occupant B. Thus, the airbag 10 is placed between the vehicle door C and the body of the occupant B from the shoulder Ba to the lumbar Bd. Therefore, if a part of the vehicle body enters the vehicle cabin, the occupant B is pushed by the airbag 10 toward the center of the vehicle cabin in the vehicle width

direction, and the body of the occupant B from the shoulder Ba to the lumbar Bd is protected.

[0026]

In the occupant protection device according to the first embodiment, the airbag 10 has the recess 12 for receiving the projecting portion of the occupant B, i.e., the upper arm Bf that projects in the vehicle width direction from the side of the occupant B facing the door C, in the inflated state. Therefore, in this occupant protection device, the recess 12 of the airbag 10 corresponding to the upper arm Bf of the occupant B prevents a particular part, for example, the chest Bb of the occupant B from being locally pressed by the upper arm Bf. Accordingly, when a side collision or the like of the vehicle occurs, a particular part, for example, the chest Bb of the occupant B is prevented from receiving a large local load.

[0027]

In addition, in the occupant protection device according to the first embodiment, the recess 12 of the airbag 10 is formed by cutting out the corresponding portion of the airbag 10 in advance. Accordingly, the volume and weight of the airbag material are reduced. Therefore, the airbag 10 can be folded into a small package and be stored in a small space in the seat back Aa.

[0028]

In the above-described first embodiment, the recess 12 is formed by cutting out the corresponding portion of the airbag 10 in advance. Alternatively, however, the recess may also be formed as in a modification schematically illustrated in Figs. 3 to 5 or in a modification schematically illustrated in Figs. 6 and 7.

[0029]

Figs. 3 to 5 illustrate a first modification of the first embodiment. In the first modification, a recess 12 of an airbag 10 is formed of an oval uninflatable section 13 provided at a position corresponding to the upper arm Bf of the occupant B. The oval uninflatable section 13 is formed by partially bonding a folded airbag material, and is surrounded by an inflatable body 14. Accordingly, in the first modification, the recess 12 is formed in the airbag 10 at the corresponding position without reducing the rigidity of the airbag 10 in the inflated state.

[0030]

Figs. 6 and 7 illustrate a second modification of the first embodiment. In the second modification, a recess 12 of an airbag 10 is formed of an uninflatable section 13a provided at a position corresponding to the upper arm Bf of the occupant B and extending to the front edge of the airbag 10. The uninflatable section 13a is formed by partially bonding a folded airbag material.

[0031]

In the above-described modifications, the airbag 10 has the recess 12 that can receive the upper arm Bf of the occupant B. Alternatively, however, as in a second embodiment schematically illustrated in Figs. 8 and 9, a recess 112 that can receive a projecting portion, e.g., an armrest Ca, on the inner side of a door C may also be formed in an airbag 110. The recess 112 in the airbag 110 is formed of an oval uninflatable section 113 provided at a position corresponding to the armrest Ca on the inner side of the door C. The oval uninflatable section 113 is formed by partially bonding a folded airbag material, and is surrounded by an inflatable body

114.

[0032]

In the second embodiment, the airbag 110 has the recess 112 that receives the armrest Ca on the inner side of the door C in the inflated state. Therefore, the airbag 110 is prevented from being pushed by the armrest Ca on the inner side of the door C, and the load applied to the chest Bb of the occupant B from the airbag 110 is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest Bb of the occupant B is prevented from receiving a large local load.

[0033]

In addition, also in the second embodiment, the oval uninflatable section 113 is surrounded by the inflatable body 114. Therefore, similar to the first modification of the second embodiment, the recess 112 is formed in the airbag 110 at the corresponding position without reducing the rigidity of the airbag 110 in the inflated state.

[0034]

In the above-described second embodiment, the airbag 110 has the recess 112 that can receive the armrest Ca on the inner side of the door C. Alternatively, however, as in a third embodiment schematically illustrated in Figs. 10 and 11, an upper airbag 210A and a lower airbag 210B that face each other across the armrest Ca on the inner side of the door C may also be applied.

[0035]

The upper airbag 210A is disposed at a position corresponding to the shoulder Ba of the occupant B, and is attached to the seat back Aa of the seat A. In addition, an inflator 220A is disposed in the upper airbag

210A. The lower airbag 210B is disposed at a position corresponding to the lumbar Bd of the occupant B, and is also attached to the seat back Aa of the seat A. In addition, an inflator 220B is disposed in the lower airbag 210B. In the third embodiment, the upper airbag 210A is thicker than the lower airbag 210B in the vehicle width direction in the inflated state.

[0036]

The inflators 220A and 220B can be activated individually. In the third embodiment, the lower inflator 220B is activated before the inflator 220A so that the lower airbag 210B is inflated before the upper airbag 210A.

[0037]

In the third embodiment having the above-described structure, when a side collision or the like of the vehicle occurs and the door C enters the vehicle cabin, the airbags 210A and 220B are barely pushed by the armrest Ca on the inner side of the door C. The upper airbag 210A mainly pushes the shoulder Ba of the occupant B toward the center of the vehicle cabin in the vehicle width direction, and the lower airbag 210B mainly pushes the lumbar Bd of the occupant B toward the center of the vehicle cabin in the vehicle width direction. Accordingly, when a side collision or the like of the vehicle occurs, the chest Bb of the occupant B is prevented from receiving a large local load.

[0038]

In addition, in the third embodiment, the upper airbag 210A is thicker than the lower airbag 210B in the vehicle width direction in the inflated state. Therefore, a relatively large upper space between the shoulder Ba of the occupant B and an upper portion of the door C above the armrest Ca and a relatively small lower space between the lumbar Bd of the occupant B and a

lower portion of the door C below the armrest Ca can be reliably filled with the upper and lower airbags 210A and 210B, respectively. Accordingly, the occupant can be reliably protected.

[0039]

In addition, in the third embodiment, the lower airbag 210B is inflated before the upper airbag 210A. Accordingly, the lower airbag 210B can be reliably inflated in the lower space between the lumbar Bd of the occupant B and the lower portion of the door C below the armrest Ca, which is smaller than the upper space between the shoulder Ba of the occupant B and the upper portion of the door C above the armrest Ca.

[0040]

In addition, in the third embodiment, the upper and lower airbags 210A and 210B are provided with dedicated inflators 220A and 220B, respectively. Therefore, the times at which the inflators 220A and 220B are activated can be controlled individually, and the upper and lower airbags 210A and 210B can be inflated individually at desired times.

[0041]

In the above-described third embodiment, the upper and lower airbags 210A and 210B that face each other across the armrest Ca on the inner side of the door C are used. Alternatively, however, as in a modification illustrated in Fig. 12, an airbag 210 having an upper inflatable body 210a and a lower inflatable body 210b may also be used. In this case, the upper and lower inflatable bodies 210a and 210b are disposed so as to face each other across the armrest Ca on the inner side of the door C.

[0042]

In this modification, an operation similar to that of the

above-described third embodiment can be performed using an inflator 220 having a gas discharge hole 221 only at the top end thereof. In addition, in this modification, the upper inflatable body 210a has an uninflatable section 213 at a position corresponding to the upper arm Bf of the occupant B, so that a region corresponding to the upper arm Bf of the occupant B is thinner than other regions in the vehicle width direction in the inflated state.

[0043]

Therefore, the upper arm Bf of the occupant B is prevented from being pushed by the upper inflatable body 210a of the airbag 210, and the load applied to the chest Bb of the occupant B by the upper arm Bf of the occupant B pushed by the upper inflatable body 210a is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest Bb of the occupant B is prevented from receiving a large local load.

[0044]

Figs. 13 and 14 illustrate a fourth embodiment. In the fourth embodiment, an airbag 310 is provided with straps 315a and 315b. As shown in Fig. 13, the upper strap 315a is provided at a position corresponding to the upper arm Bf of the occupant B and regulates the inflation of the airbag 310 such that a recess 312a provided at a position corresponding to the upper arm Bf of the occupant B extends along the upper arm Bf of the occupant B when the airbag 310 is inflated. As shown in Fig. 14, the lower strap 315b is provided at a position corresponding to the abdomen Bc of the occupant B and regulates the inflation of the airbag 310 such that a recess 312b provided at a position corresponding to the abdomen Bc of the occupant B extends along the abdomen Bc of the occupant B when the airbag 310 is inflated.

[0045]

Accordingly, in the fourth embodiment, a contact area between the recess 312a of the airbag 310 and the upper arm Bf of the occupant B and a contact area between the recess 312b of the airbag 310 and the abdomen Bc of the occupant B are increased compared to those in the above-described embodiments. Accordingly, when a side collision or the like of the vehicle occurs, the upper arm Bf and the abdomen Bc of the occupant B are prevented from receiving a large local load.

[0046]

Fig. 15 illustrates a fifth embodiment. In the fifth embodiment, an airbag 410 is formed in a bag-like shape by airtightly bonding two sheets of airbag material obtained by draping at a peripheral region thereof. Accordingly, the side of the airbag 410 which faces the door C substantially extends along the inner side of the door C, and the side of the airbag 410 which faces the occupant B substantially extends along the side of the occupant B.

[0047]

In addition, the airbag 410 has an inflatable body 414 that fills a space between the inner side of the door C and the side of the occupant B which faces the door C in the inflated state. Therefore, in the fifth embodiment, the substantial contact area between the airbag 410 and the occupant B is increased. Accordingly, when a side collision or the like of the vehicle occurs, the side portion of the occupant B, that is, the shoulder Ba, the chest Bb, the abdomen Bc, and the lumbar Bd is prevented from receiving a large local load.

[Brief Description of the Drawings]

Fig. 1 is a side view schematically illustrating an occupant protection device according to a first embodiment of the present invention.

Fig. 2 is a vertical sectional view of Fig. 1 taken along line S1-S1.

Fig. 3 is a side view schematically illustrating a first modification of the first embodiment.

Fig. 4 is a vertical sectional view of Fig. 3 taken along line S2-S2.

Fig. 5 is a horizontal sectional view of Fig. 3 taken along line S3-S3.

Fig. 6 is a side view schematically illustrating a second modification of the first embodiment.

Fig. 7 is a vertical sectional view of Fig. 6 taken along line S4-S4.

Fig. 8 is a side view schematically illustrating an occupant protection device according to a second embodiment of the present invention.

Fig. 9 is a vertical sectional view of Fig. 8 taken along line S5-S5.

Fig. 10 is a side view schematically illustrating an occupant protection device according to a third embodiment of the present invention.

Fig. 11 is a vertical sectional view of Fig. 10 taken along line S6-S6.

Fig. 12 is a side view schematically illustrating a modification of the third embodiment.

Fig. 13 is a vertically sectioned front view schematically illustrating an occupant protection device according to a fourth embodiment of the present invention.

Fig. 14 is a horizontal sectional view of Fig. 13 taken along line S7-S7.

Fig. 15 is a vertically sectioned front view schematically illustrating an occupant protection device according to a fifth embodiment of the present invention.

[Document name] Abstract

[Abstract]

[Problem]

to prevent a chest of an occupant from receiving a large load when a side collision or the like of a vehicle occurs

[Means to solve]

An occupant protection device includes an airbag 10 that is inflated with gas from an inflator 20 at a side of an occupant B facing the door to protect the body of the occupant B from the shoulder Ba to the lumbar Bd. In this occupant protection device, the airbag 10 has a recess 12 that receives the upper arm Be of the occupant B in the inflated state. Therefore, a load applied to the chest Bb of the occupant B from the upper arm Be of the occupant B pushed by the inflated airbag 10 is reduced. Accordingly, when a side collision or the like of the vehicle occurs, the chest Bb of the occupant B is prevented from receiving a large local load.

[Elected view] Figure 1

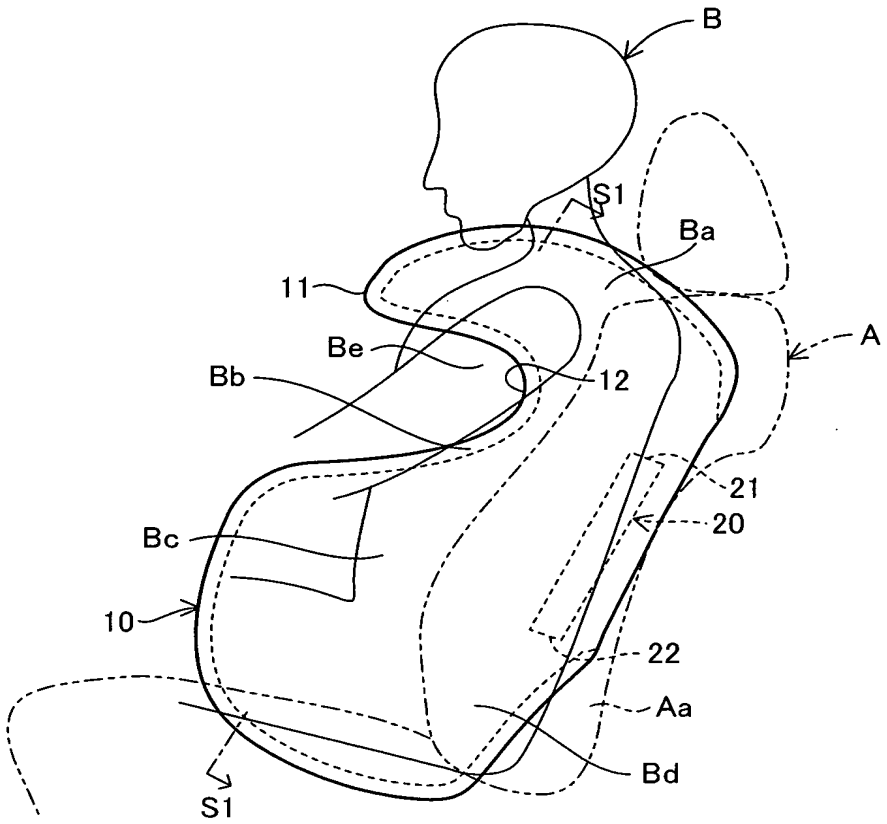

FIG.1

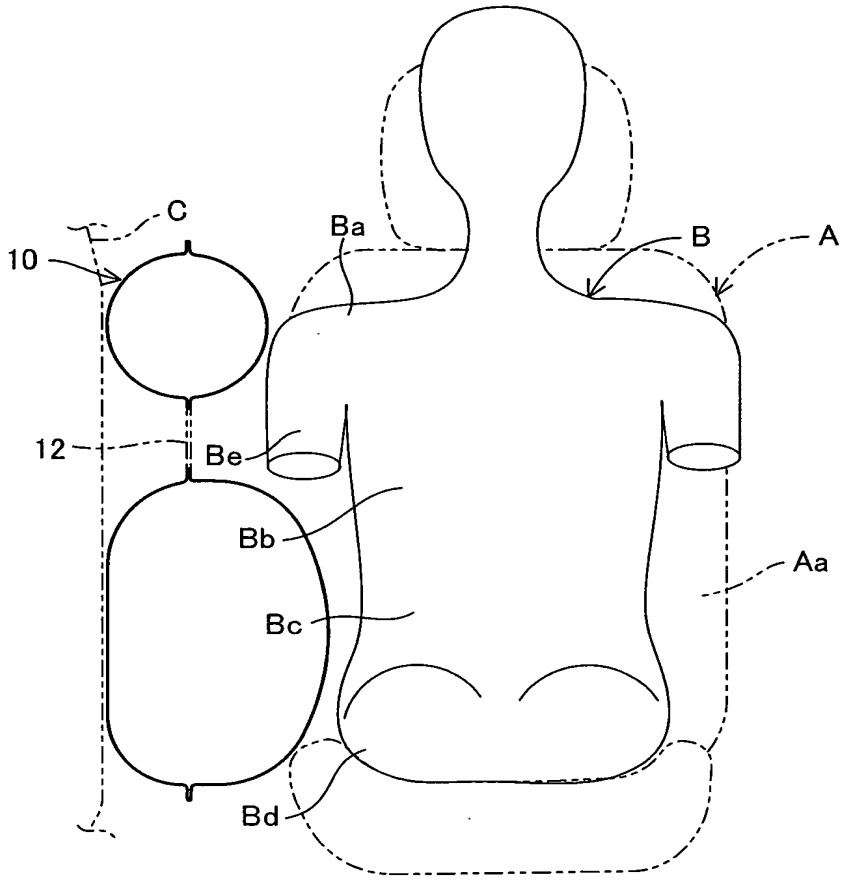

FIG.2

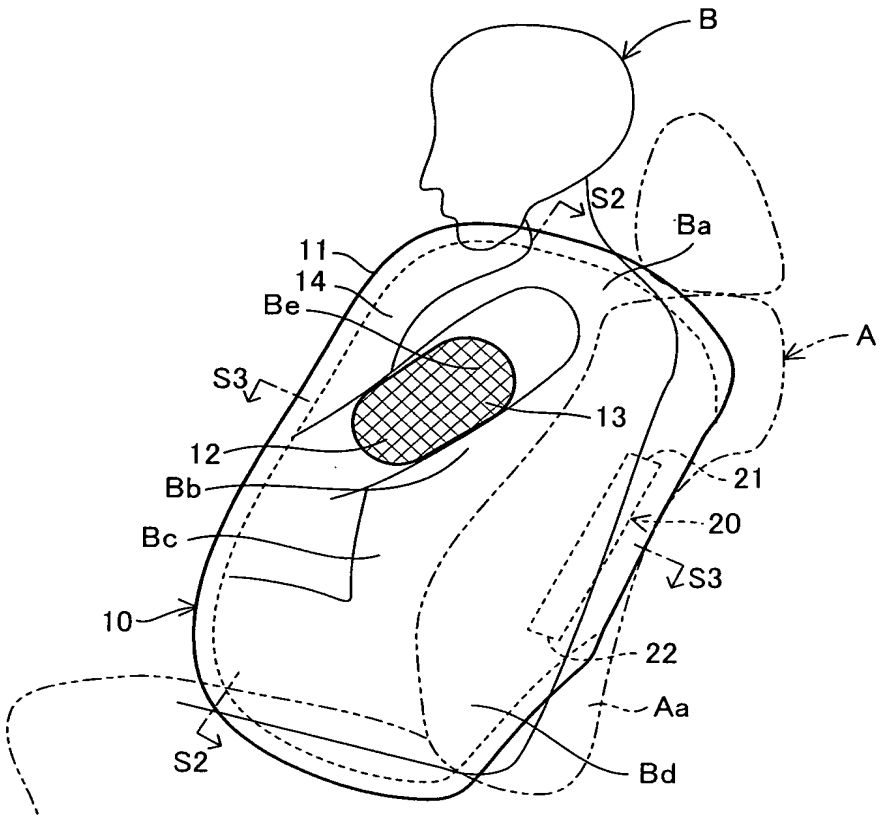

FIG.3

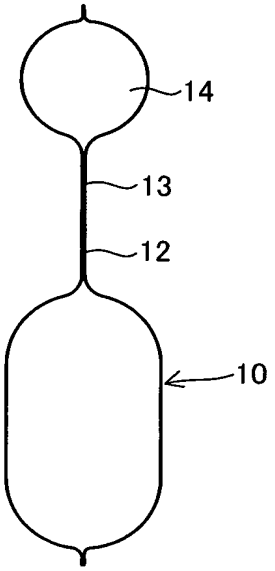

FIG.4

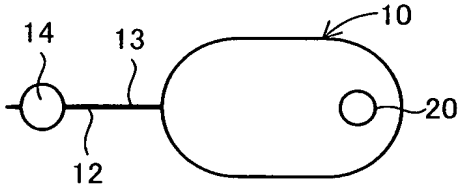

FIG.5

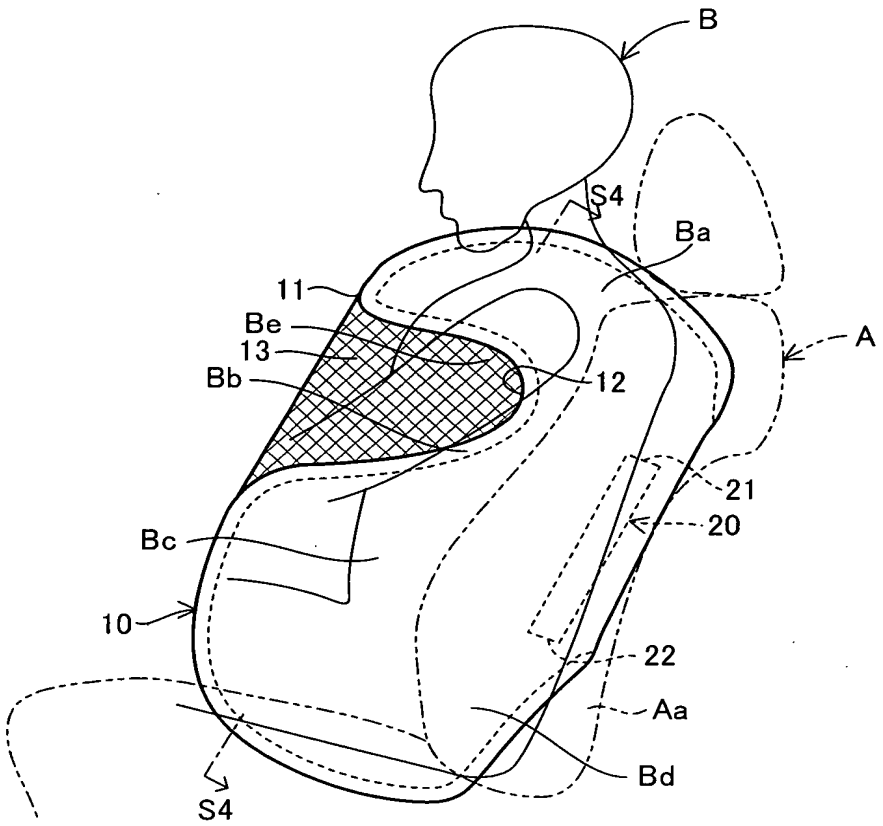

FIG.6

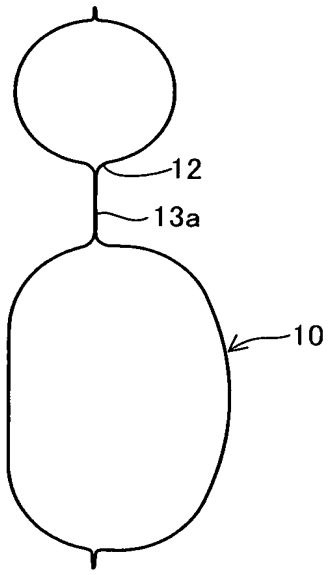

FIG.7

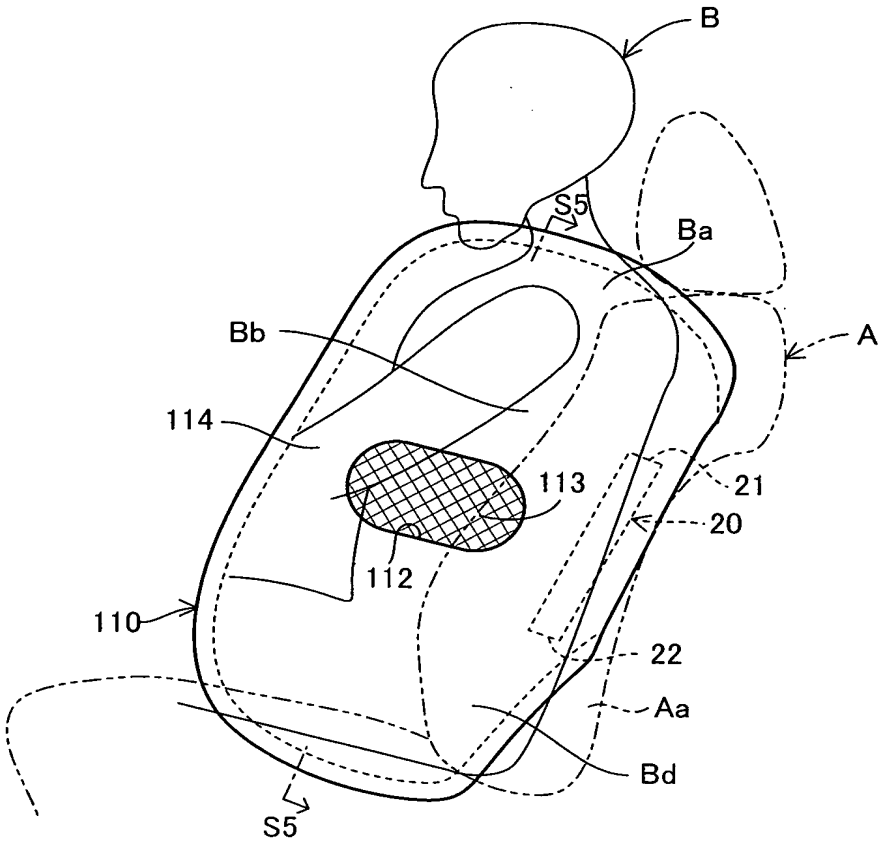

FIG.8

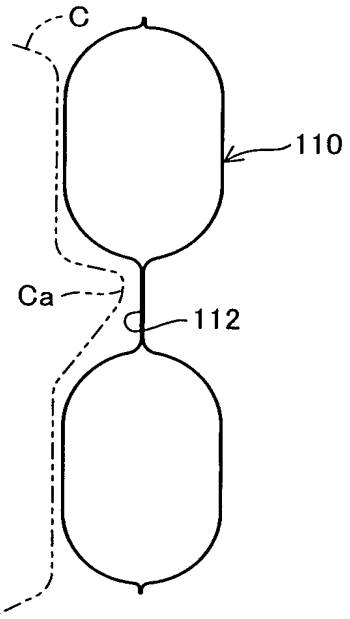

FIG.9

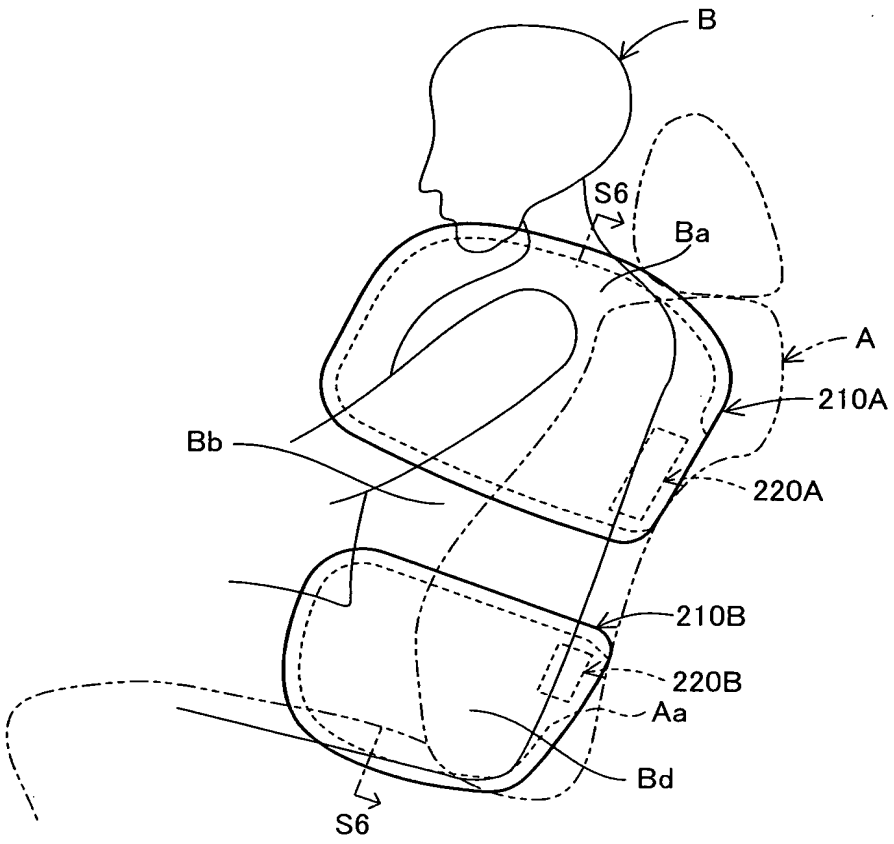

FIG.10

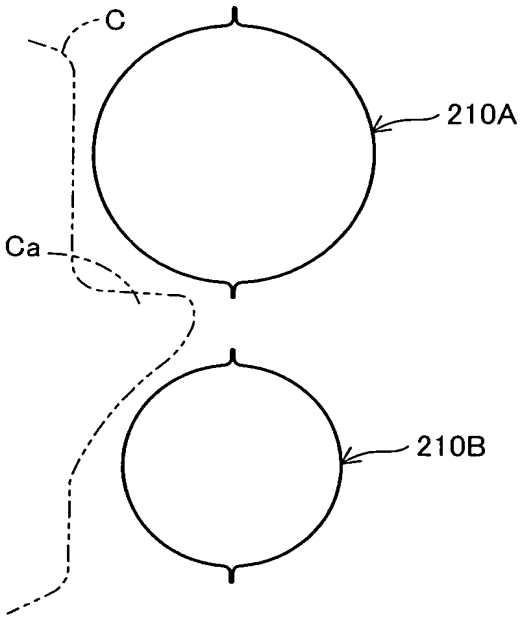

FIG.11

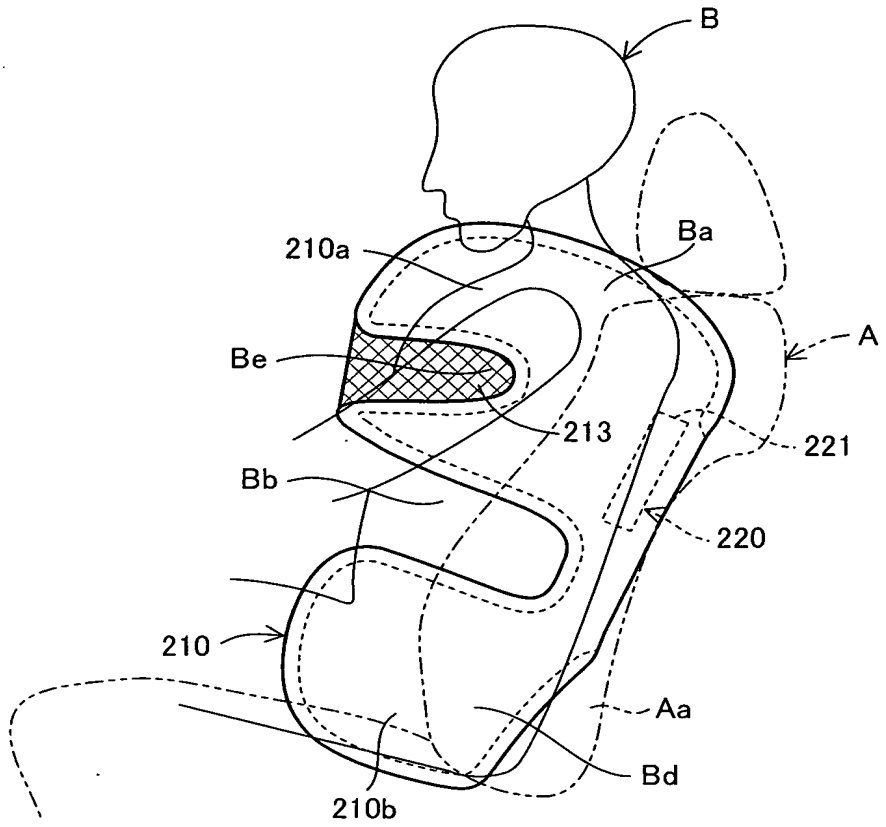

FIG.12

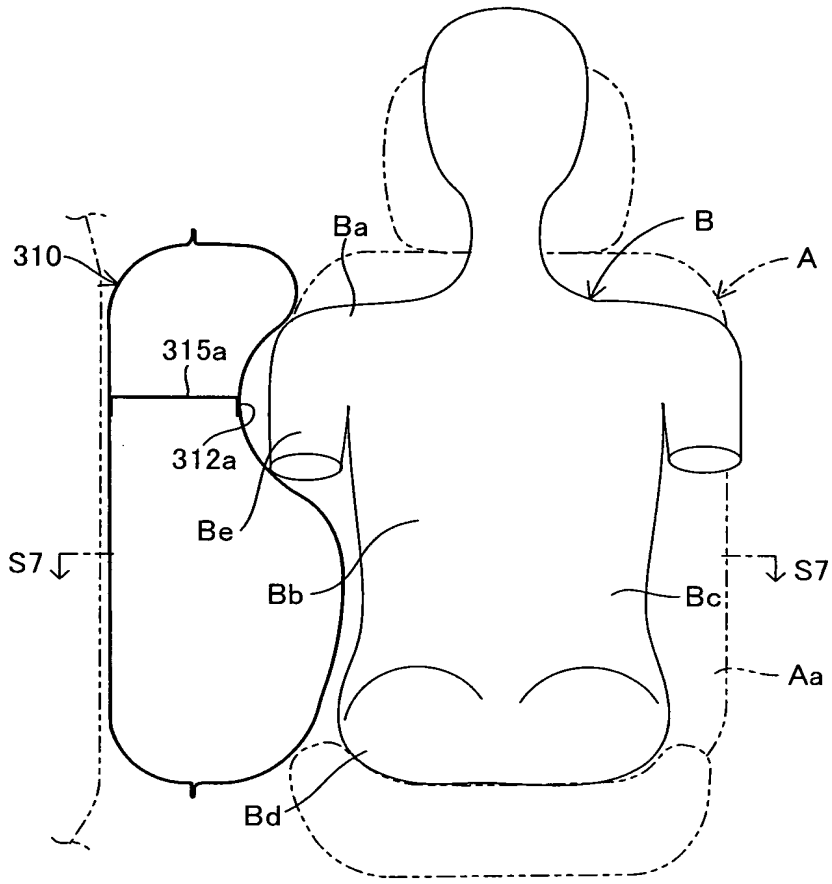

FIG.13

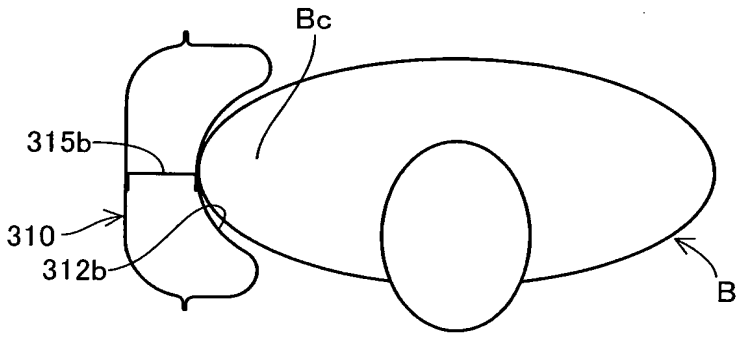

FIG.14

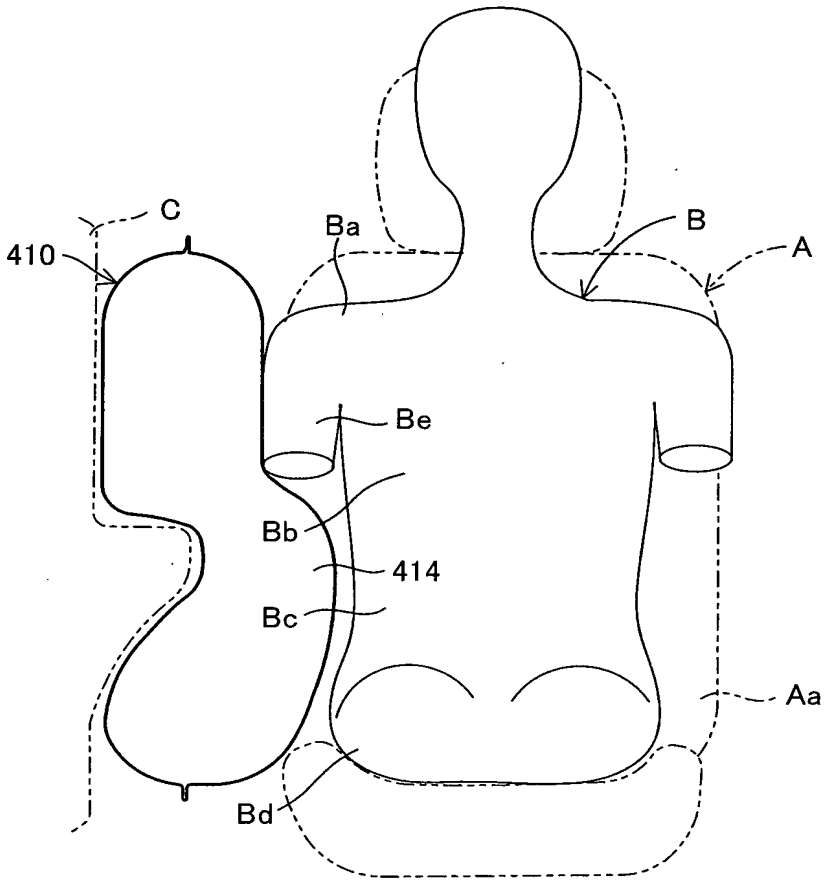

FIG.15